JOURNAL OF WOMEN'S HEALTH
Volume 18, Number 7, 2009

DOI: 10.1089/jwh.2008.0791

Original Article

Obesity, Gynecological Factors, and Abnormal Mammography Follow-Up in Minority and Medically Underserved Women

Alecia Malin Fair, Dr.P.H.,[1] Debra Wujcik, R.N., Ph.D., AOCN,[2] Jin-Mann S. Lin, Ph.D.,[3] Ana Grau, M.D.,[4] Veronica Wilson, M.D.,[5] Victoria Champion, R.N., D.N.S.,[6] Wei Zheng, M.D., Ph.D.,[7] and Kathleen M. Egan, Sc.D.[8]

Abstract

Background: The relationship between obesity and screening mammography adherence has been examined previously, yet few studies have investigated obesity as a potential mediator of timely follow-up of abnormal (Breast Imaging Reporting and Data System [BIRADS-0]) mammography results in minority and medically underserved patients.

Methods: We conducted a retrospective cohort study of 35 women who did not return for follow-up >6 months from index abnormal mammography and 41 who returned for follow-up ≤6 months in Nashville, Tennessee. Patients with a BIRADS-0 mammography event in 2003–2004 were identified by chart review. Breast cancer risk factors were collected by telephone interview. Multivariate logistic regression was performed on selected factors with return for diagnostic follow-up.

Results: Obesity and gynecological history were significant predictors of abnormal mammography resolution. A significantly higher frequency of obese women delayed return for mammography resolution compared with nonobese women (64.7% vs. 35.3%). A greater number of hysterectomized women returned for diagnostic follow-up compared with their counterparts without a hysterectomy (77.8% vs. 22.2%). Obese patients were more likely to delay follow-up >6 months (adjusted OR 4.09, $p = 0.02$). Conversely, hysterectomized women were significantly more likely to return for timely mammography follow-up ≤6 months (adjusted OR 7.95, $p = 0.007$).

Conclusions: Study results suggest that weight status and gynecological history influence patients' decisions to participate in mammography follow-up studies. Strategies are necessary to reduce weight-related barriers to mammography follow-up in the healthcare system including provider training related to mammography screening of obese women.

Introduction

Although mammography has been associated with a 44% reduction in risk of late-stage breast cancer, mammography screening can enhance survival rates only if additional diagnostic testing follows initial abnormal or inconclusive mammograms for definitive determination of breast cancer status.[1,2] One factor that diminishes the maximal benefit of mammography as an early detection breast cancer tool is inadequate follow-up for abnormal or inconclusive mammograms.[3] For women ultimately destined to have breast cancer, even a short delay in detection could have significant consequences. A meta-analysis demonstrated that women with delays of 3–6 months between index abnormal mammography findings and diagnostic resolution had 7% lower 5-year survival than those with shorter delays (odds ratio [OR] for death 1.24, 95% CI 1.17–1.30).[4]

The purpose of this study was to evaluate factors of delay of abnormal mammography follow-up in minority/medically underserved women. We hypothesized that delay in timely mammography resolution of an abnormal mammography status by minority/medically underserved women was

[1]Department of Surgery, Meharry Medical College, Nashville, Tennessee.
[2]1818 Albion Street, Clinical Trials Office, Meharry/Vanderbilt Cancer Partnership, Nashville General Hospital, Nashville, Tennessee.
[3]National Center for Zoonotic, Vector borne and Enteric Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia.
[4]Division of Surgical Oncology, Vanderbilt University, Nashville, Tennessee.
[5]Baylor University Medical Center, Dallas, Texas.
[6]Indiana University School of Nursing, Indianapolis, Indiana.
[7]Institute for Medicine and Public Health, Vanderbilt Center for Epidemiologic Research, Vanderbilt University, Nashville, Tennessee.
[8]H. Lee Moffitt Cancer Center, Tampa, Florida.

related to (1) the patient's sociodemographic status, (2) biomedical breast cancer risk factors (e.g., family history, gynecological factors), and (3) lifestyle factors (e.g., weight status, physical activity, smoking status, and alcohol intake).

Materials and Methods

Setting and design

The design was a retrospective cohort study. Patients were minority/medically underserved women having screening mammography performed at the breast health clinic located in the Nashville General Hospital at Meharry, Davidson County/Nashville, Tennessee. The American College of Radiology (ACR) Breast Imaging Reporting and Data System (BIRADS™) categories used to standardize interpretation of mammography findings were used to identify eligible study participants. The eligibility criteria for the study were (1) an abnormal mammography result requiring diagnostic follow-up prior to the next routine screening of BIRADS-0,[5] (2) age of 40–75 years between January 2003 and December 2004, (3) residency in an eight county radius around Davidson County, and (4) ability to provide informed consent. Eligible women were identified using retrospective chart review abstracted from radiology clinic notes in the medical records. The administrative appointment database, Mammography Reporting System (MRS), was abstracted for the date of the abnormal mammography finding, demographic data, and the date when the patient returned for diagnostic follow-up.

Follow-up was defined as return for diagnostic resolution within 6 months from the date of the abnormal screening mammography finding BIRADS-0 (incomplete, needs additional imaging).[5] Diagnostic resolution included such procedures as additional mammography views (compression or magnification), biopsy (core or excisional), and ultrasonography. Although no gold standard exists to determine what constitutes timely follow-up,[6] we dichotomized this variable based on literature that suggests diagnostic and treatment delays of 3–6 months may negatively impact survival.[2] Study participants who received inadequate follow-up were defined as BIRADS-0 patients without diagnostic resolution within 6 months after their index abnormal finding. Study participants who received adequate follow-up were defined as BIRADS-0 patients with diagnostic resolution within 6 months after their index abnormal finding. The disposition of the follow-up of the BIRADS-0 was determined prior to the survey interview, using the reference date of the index mammography finding with the BIRADS-0 result in the medical record and abstracting the records for all mammograms that occurred or did not occur subsequent to that date. Women with a prior history of cancer or who were deceased at the time of the scheduled interview were not eligible for the study.

Study procedures

Study procedures were approved by the Institutional Review Boards at Meharry Medical College and Nashville General Hospital prior to study implementation. Those BIRADS-0 patients identified as eligible from the medical record review were recruited for the survey interview portion of the study. Eligible women were sent a letter from the medical director of the breast health center (A. G.) inviting them to participate in the study interview, explaining the study, and informing them that they would be reimbursed $15 for their time and effort in participating in the study. A toll-free number was provided for patients to call for study refusal. The postal service's ancillary service endorsement ("Forwarding Service Requested") was written on the envelopes of the introductory letters to provide free forwarding of the letter to the patient's most up-to-date address if it was different from the address listed in the patient's medical record. In many instances, patients had relocated, and the introductory letter was returned as undeliverable. If another address was obtained by the research staff, a second introductory letter was sent to the new address. Alternate addresses were attempted when necessary, including the emergency contact identified from the patient's medical record and the billing system.

All patient contacts and interviews were completed by one full-time trained research assistant, who completed a week of training on psychosocial and epidemiological data collection techniques: obtaining informed consent and Health Information Portability and Accountability Act (HIPAA) waivers over the phone, explaining study confidentiality, probing techniques, how to pose study questions without being leading or biased, data entry, and verbatim editing. The research assistant piloted these techniques through an epidemiological survey instrument with 20 subjects.

After the study invitation letter was sent, the women were allowed 10 days to call the refusal line. A call center unrelated to study staff and location was established to answer the refusal line to avoid coercion of study participants. Tacit consent was obtained if the woman did not call the refusal line within 10 days. After the refusal period, the research assistant attempted to schedule the patient for the survey interview. If the woman was reached, an appointment for completion of the survey was scheduled contingent on the patient's receiving the study materials. Participants were sent a study packet consisting of an informed consent form, an HIPAA waiver, a reimbursement form, and the study instruments. During the scheduled telephone appointment, participants verbally consented, and the survey instrument was read to them over the telephone.

Associated factors

Demographic and clinical variables, such as race, ethnicity, age, marital status, health insurance and social history, mammography interpretation, and radiologist recommendation, were obtained from medical record chart review by a certified tumor registrar. The survey contained 166 items and was adapted from Champion's Community Interventions to Increase Mammography Screening (CIIMS) study.[7] Telephone interviews assessed epidemiological and clinical risk factors, including family history of cancer, smoking status, alcohol intake, gynecological factors, hormonal history, and menopausal status. Self-reported weight status and height were used to calculate the body mass index (BMI) expressed in kg/m^2. Physical activity was measured by recording the past 10 years of regular exercise activities in metabolic equivalents (MET) of duration (hours/week) values, years of participation, and average energy expenditure during the past 10 years period (MET-hours/day/year) using standard methods.[8] Eight psychosocial constructs were examined using multivariate logistic regression for their association

with abnormal mammography follow-up: (1) perceived barriers,[7] (2) perceived benefits,[7] (3) perceived susceptibility,[7] (4) self-efficacy,[9] (5) cancer fatalism,[10–12] (6) health temporal orientation,[13] (7) multidimensional health locus of control with two dimensions (internal/external),[14] and (8) spiritual health locus of control measuring active and passive spirituality.[15,16]

Subjects and sample size

A total of 227 women were identified who received a screening mammography between January 2003 and December 2004 with an abnormal BIRADS-0 result. Of these women, 11% ($n = 18$) were not eligible to participate in the study because of age, not residing in an eight county radius around Nashville, a history of cancer, inability to provide consent, or being deceased or too ill to participate, leaving 209 women. In addition, we were not able to contact 68 women because of disconnected phones, changed phone numbers, changed addresses, or no answer to the telephone calls ($n = 27$, 11.9% of the inadequate follow-up patients; $n = 41$, 18.0% of the adequate follow-up patients). An additional 18% refused ($n = 17$, 7.5% of the inadequate follow-up patients; $n = 24$, 10.6% of the adequate follow-up patients), and 10.5% partially completed the interview ($n = 13$, 5.7% of the inadequate follow-up patients; $n = 11$, 4.8% of the adequate follow-up patients). Findings on the 151 women who did not participate in this study after 3 months of effort or 12 attempts to contact them for study participation have been reported elsewhere.[17]

Overall, there was a marginally significant disparity in age between women who did and did not participate. A higher frequency of women between the ages of 40 and 50 years (56.3%) did not participate vs. women who did participate in this age range (47.7%) ($p < 0.07$). More inadequate follow-up patients were reached than adequate follow-up patients (61% inadequate follow-up vs. 49% adequate follow-up, $p = 0.03$), and African American women with inadequate follow-up status were more likely to respond than African American women with an adequate follow-up status (odds ratio [OR] 4.07, 95% confidence interval [CI] 1.59–10.30, $p = 0.003$). Although 41 women refused to participate, only 29 women self-reported their race. Of the 29 women with race identified who refused to participate, 52% ($n = 15$) were African Americans. Of 24 women who agreed to participate but did not complete the interview or withdrew their consent, 58% ($n = 14$) were African Americans. Minority women who were located from the contact information in the medical record and who were approached for study participation were not opposed to enrolling in abnormal mammography follow-up research. However, a higher percentage of minority women than their Caucasian counterparts failed to complete the detailed phone interview.[17]

Statistical analysis

Baseline demographic, clinical, and survey data were compared between inadequate follow-up patients and adequate follow-up patients. Bivariate associations between the covariates and two groups (based on timely follow-up) were assessed with univariate logistic regression; ORs with 95% CIs are reported. Significant predictors of inadequate follow-up identified in the univariate logistic regression model were further adjusted for other potential confounders. We ran two models for adjustment. In model A, each significant predictor variable was analyzed independently adjusting for sociodemographic variables, including age, race, education, income, insurance, and menopausal status. In model B, all significant predictor variables were included in the model along with the sociodemographic variables and menopausal status. The objective of this pilot study was to estimate effect sizes for this population, so that full-scale and appropriately powered studies can be planned. Because of the small sample size, we were unable to look at interaction terms between the predictor variables. All statistical analyses were performed with SAS version 9.1. (SAS, Cary, NC).

Results

A total of 76 interviews was achieved, including 35 inadequate follow-up patients and 41 adequate follow-up patients, for an overall response rate of 54% among inadequate follow-up patients and 46% among adequate follow-up patients. Of these, 59% ($n = 39$) of African American women, 69% ($n = 29$) of Caucasian women, and 50% ($n = 8$) of women self-categorized as race/ethnicity "Other" of Hispanic/Latina or Middle Eastern ethnicity completed the survey. Generally speaking, the psychosocial factors were not associated with the significant covariates found in the current analysis. Results from the psychosocial analyses will be reported in a future companion article.

Table 1 shows the percentages by follow-up status of sociodemographic characteristics and breast cancer risk factors of the participants. There were no statistically more likely to be obese significant differences between inadequate follow-up and adequate follow-up with respect to age, income, health insurance, race, and education. Compared with adequate follow-up patients, inadequate follow-up patients were more likely to be obese (BMI $>30\,kg/m^2$), and a higher frequency of obese women delayed return for timely mammography resolution compared with nonobese women (64.7% vs. 35.3%). A greater number of women with a hysterectomy returned for diagnostic follow-up than those without a hysterectomy (77.8% vs. 22.2%) (Table 1). Odds ratios for the association of breast cancer risk factors with timely mammography follow-up are shown in Table 2. In multivariate models adjusted for sociodemographic variables and menopausal status, obese women were more likely to experience a 6 month delay in mammography follow-up compared with women who were nonobese (OR 4.09, 95% CI 1.26–13.22, $p = 0.02$). A significant association also was observed between hysterectomy status delay in mammography follow-up. Women with hysterectomies were more likely to return for timely mammography follow-up within 6 months than were women who did not have hysterectomies (OR 7.95, 95% CI 1.78–35.49, $p = 0.007$). In the second multivariate model in Table 2, adjusting for sociodemographic variables, menopausal status, and the three significant variables listed in Table 1, BMI $>30\,kg/m^2$ (obesity) was no longer a significant predictor of return for abnormal mammography follow-up.

Discussion

In this study, more women who experienced a delay in timely mammography were obese than were women

Table 1. Bivariate Association between Lifestyle/Reproductive Factors and Inadequate Follow-Up: Return after Mammography Study (RAMS), 2003–2006 ($N = 76$)[a]

Characteristic	*Inadequate follow-up* (n = 35)	*Adequate follow-up* (n = 41)	*OR (95% CI)*
Age, years			
30–49	16 (47.06%)[b]	21 (51.22%)	0.85 (0.34, 2.10)
≥50	18 (52.94%)	20 (48.78%)	1
Income			
≤$20,000	12 (35.29%)	17 (42.50%)	0.91 (0.28, 2.94)
$20,000–$40,000	10 (29.41%)	11 (27.50%)	0.71 (0.24, 2.10)
>$40,000	12 (35.29%)	12 (30.00%)	1
Health insurance			
TennCare/Medicare	8 (22.85%)	16 (39.02%)	0.32 (0.09, 1.14)
Commercial (BCBS, Cigna)	11 (31.43%)	13 (31.71%)	0.64 (0.13, 3.03)
Other	5 (14.29%)	5 (12.20%)	0.54 (0.16, 1.87)
None	11 (31.43%)	7 (17.07%)	1
Race/ethnicity			
White	11 (31.43%)	20 (48.78%)	1
Black	22 (62.86%)	20 (48.78%)	2.00 (0.77, 5.19)
Other[c]	2 (5.71%)	1 (2.44%)	3.64 (0.30, 44.77)
Education			
≤ High school or GED	17 (48.57%)	20 (50.0%)	0.94 (0.38, 2.34)
> High school	18 (51.43%)	20 (50.0%)	1
Smoking status			
Nonsmoker	19 (54.29%)	19 (46.34%)	1
Past smoker	9 (25.71%)	13 (31.71%)	0.69 (0.24, 2.01)
Current smoker	7 (20.00%)	9 (21.95%)	0.78 (0.24, 2.52)
Alcohol intake history (past year)			
Never	5 (31.25%)	7 (29.17%)	1
≥1 drink/week	3 (18.75%)	8 (33.3%)	0.53 (0.09, 3.03)
>2 drinks/day	8 (50.00%)	9 (37.50%)	1.24 (0.28, 5.53)
Body mass index (kg/m^2)			
Non–obese	12 (35.29%)	28 (70.00%)	1
Obese	22 (64.71%)	12 (30.00%)	4.28 (1.61–11.35)
Physical activity (MET-hours/day/year)			
0 hours per week	21 (60.00%)	24 (58.54%)	1
0 < MET < 11	9 (25.71%)	6 (14.63%)	1.71 (0.52, 5.62)
≥11	5 (14.29%)	11 (26.83%)	0.52 (0.16, 1.74)
Birth control			
Never	6 (17.14%)	6 (14.63%)	1
Ever	29 (82.86%)	35 (85.37%)	0.83 (0.24–2.85)
Hormone use			
No	23 (65.71%)	25 (60.98%)	1
Yes	12 (34.29%)	16 (39.03%)	0.82 (0.32, 2.08)
Hysterectomy			
No	15 (62.50%)	6 (22.22%)	1
Yes	9 (37.50%)	21 (77.78%)	5.83 (1.71, 19.90)
Live birth			
No	3 (8.57%)	11 (26.38%)	1
Yes	32 (91.43%)	30 (73.17%)	3.91 (0.99,15.39)

[a]Inadequate follow-up defined as BIRADS-0 patients without diagnostic resolution within 6 months after their index abnormal finding; adequate follow-up defined as BIRADS-0 patients with diagnostic resolution within 6 months after their index abnormal finding.
[b]Column percentage.
[c]Other: Hispanic/Latina and Middle Eastern.

obtaining timely mammographic follow-up. The reasons obese women are less likely to obtain abnormal mammography follow-up are still poorly understood. We surmise that reasons for this discrepancy may be similar to those women in the obese population who do not receive screening mammography or Pap smear screening for cervical cancer.

Previous research has shown either a positive,[18] inverse,[18–29] or null[19,20,23] association between obesity and adherence to cancer screening tests. Disparities in cancer screening in obese women may be exacerbated by patient and clinician attitudes. Increasing weight has been associated with having a negative self-perception and poor body image[26,28,29] and being reluctant to obtain pelvic examinations.[20–28] Obese women may experience greater embarrassment about weight and have a perception of increased pain and discomfort from gynecological procedures.[30] Additionally, obese women may delay screening mammograms and Pap smears because they

Table 2. Adjusted OR (95% CIs for Mammography Follow-Up Associated with BMI and Reproductive Factors: RAMS Study, 2003–2006, $N=76$

Characteristic	*Adjusted OR*[a] *(95% CI)*	p *value*	*Adjusted OR*[b] *(95% CI)*	p *value*
Body mass index (kg/m^2)		0.019		0.265
Nonobese ($\leq$29.9 kg/m^2)	1		1	
Obese (>30 kg/m^2)	4.09 (1.26–13.22)		2.59 (0.49–13.78)	
Hysterectomy		0.007		0.008
No	1		1	
Yes	7.95 (1.78–35.49)		10.14 (1.82–56.56)	
Live birth		0.104		0.230
No	1		1	
Yes	3.55 (0.77–16.31)		7.92 (0.27–231.54)	

[a]Each significant predictor was adjusted separately for sociodemographic variables, including age, race, education, income, insurance, and menopausal status.

[b]Three significant predictors were all in the model along with sociodemographic variables and menopausal status. When including all these factors, only 48 women had valid information on all variables used in the model.

encounter negative attitudes, judgments, and bias from health professionals.[20,28] They may delay or avoid preventive visits because they do not want to be weighed or receive lectures about their weight.[4,31,32] Amy et al.[28] found that 41% of women with BMIs ranging from 25 to 122 kg/m^2 delayed seeking cancer screening tests because of their weight. An association emerged where the percentage of women who delayed seeking cancer screening increased significantly as BMI increased. Unlike our population of medically underserved patients, access to healthcare for these obese women was not a barrier, as >90% had health insurance.[28]

In terms of disparities, this study has only indirect implications. The minority and medically underserved participants analyzed in this study are socioeconomically disadvantaged and have limited or no health insurance to cover medical costs; they were not compared to a nonminority, adequately served comparison group. Therefore, we are limited in evaluating these effects.

The findings about hysterectomy status as related to mammography follow-up were unexpected. One plausible interpretation of this finding is that hysterectomized women are more likely to return for follow-up diagnostic resolution if they are on estrogens and progestin regimens, which have a higher probability of requiring short interval follow-up for mammography screening.[25,33,34] Previous studies[35] show that women who take hormone replacement therapy (HRT) are more likely to use various medical and screening services, including mammography, than women who do not use HRT.[36,37] Furthermore, the relationship between HRT and hysterectomy may cause increased vigilance and cancer surveillance for hysterectomized women, thereby prompting providers to recommend mammography follow-up.[38]

Hysterectomy may be a key discriminator of follow-up of abnormal mammography, as this finding suggests that women may be referred or reminded more often by their healthcare providers to obtain preventive health visits or to be more conscientious about their health overall. Healthcare provider recommendations are among the strongest independent predictors of a person's decision to have a cancer screening test.[21,35,39] It can be posited that women who have received a hysterectomy are exposed to a greater number of encounters with specialists in women's health, which provides heightened opportunities to refer hysterectomized women to mammography screening.

Strengths and limitations

This study is not population based and has patients from a single health center. Our study results are limited to medically underserved women served by our public hospital who could be reached for interview. Despite this limitation, our statistically significant findings on obesity and hysterectomy status provide factors for additional studies to examine for generalizability.

The subjects in this study were recruited to participate in a telephone questionnaire up to 1 year after their index abnormal mammography finding (BIRADS-0). Recall bias represents a threat to the internal validity and a tendency toward misclassification errors among study subjects. Because our study relies on self-reporting of past behaviors, patients with inadequate follow-up may recall their behaviors in a way different from that of adequate follow-up patients. As returning for mammography follow-up is a socially desirable behavior, a more conservative estimate of inadequate mammography follow-up may have occurred, attenuating the true association and suggesting that some of the null associations in our study may be due to misclassification error in inadequate mammography follow-up assessment.[40,41] When possible, the medical records and questionnaire were used in concert to reduce recall bias and verify the information of the last mammogram reported after the index abnormal mammogram. The number of women for whom the outcome, mammography follow-up in $\leq$6 months, was verified by self-report is 71 vs. 5 women whose outcome was verified by medical record abstraction.

The primary instrument used to obtain mammography follow-up information was tested for reliability and validity in a population of medically underserved and minority mammography screening patients from the CIIMS study.[7] In addition, distinct from other studies,[18,19,25–27,42] mammography screening history was obtained from medical record abstraction as opposed to patient self-report. Although self-report of mammography history is highly correlated with recorded information,[26] self-reported mammography use tends to be overestimated, and the validity of self-reported mammography is relatively low in medically underserved minority women.[42]

Locating respondents for interview was more difficult than anticipated, contributing to our lower than planned

patient study participation rates. The concern with diminished participation in this study is selection bias resulting in differential exposure between refusing and participating inadequate and adequate follow-up patients, respectively.[41,43] Medical record data collected from the nonrespondents provided the opportunity to examine possible selection bias. Nonrespondents were more likely to be African American or in the "Other" ethnic/racial category and between the ages of 40 and 50 years of age.[17] Adequate participation and retention are critical methodological issues in observational epidemiology. Where there are differences in participation by race, findings may be misinterpreted or irrelevant to the target population of interest.[44–47]

The lower than anticipated numbers of study participants resulted in a study underpowered to detect interactions in the multivariate logistic regression models. We discovered that the obesity findings were no longer significant when all the variables were adjusted for in the model simultaneously. A larger sample size is required to detect an OR of 4 for BMI $>30\,kg/m^2$ (obesity) with eight other covariates in the model. We attribute the inability to detect small effects shown as significant in the mammography screening literature (smoking, alcohol intake) to inadequate power.[24,48] Moreover, a concerted effort was made to contact, consent, and interview women. On average, it took 82 days and 4.5 (range 1–19) attempts to reach each woman in our sample. The majority of African American participants (58%) did not complete the study or refused to participate once located (52%), contributing to our lower than planned completion and consent rates.[17]

We surmise that two factors led to poor participation: (1) the length of the questionnaire (166 items) was structured to be administered in one telephone session and may have caused a response burden, and (2) this study entailed one telephone interaction with the participant, but we did not provide informative feedback on how study participation could benefit her.[49] In an attempt to maximize retention of minority study participants, the interviewer was an ethnic minority female, although not of African American descent. In a previous epidemiological case-control study of breast cancer, African American women were less likely to complete the interview when they were invited to complete the survey by a non-African American interviewer.[47]

Conclusions

This is an exploratory retrospective cohort study that provides preliminary evidence that weight status and gynecological factors are constructs that appear to influence patients' decisions to participate in mammography follow-up studies. These factors may be surrogate measures that mediate the observed associations. There are a number of potentially mutable issues that influence the patient's decision to participate in mammography resolution, ranging from biases in the healthcare system to doctor's recommendations that affect the patient's ability to obtain diagnostic follow-up.

These results have valuable clinical and public health implications for this high-risk population, adversely affected by breast cancer mortality. Reducing disparities in breast cancer diagnosis and survival requires timely and efficient follow-up diagnostic care once an abnormality has been detected. Additional research is needed to better understand the mechanisms underlying associations observed in this report. Further refinement of a prospective, longitudinal design with an initial assessment of baseline anthropometry, gynecological history, and external factors in the healthcare environment at the time of the index screening mammography abnormal finding is currently underway. Obese and nonhysterectomized women in this sample of minority, underserved patients exhibit delayed diagnostic resolution of abnormal breast cancer screening mammography and would benefit from further intervention to affect disparities in breast cancer survival.

Acknowledgments

We thank Drs. Ken Wallston and Ted Speroff for their helpful comments. Research was funded by the National Cancer Institute U54 CA915408-04. A.M.F. was funded by ACS grant MRSGT-07-008-01-CPHPS, the Clinical Research Center of Meharry Medical College, grant P20RR011792 from the National Institutes of Health and RCMI Clinical Research Infrastructure Initiative, and National Cancer Institute grant U54 CA915408-06.

Disclosure Statement

The authors have no conflicts of interest to report.

References

1. Buseman S, Mouchawar J, Calonge N, Byers T. Mammography screening matters for young women with breast carcinoma. Cancer 2003;97:352–358.
2. Richards MA, Westcombe AM, Littlejohns P, Ramirez AJ. Influence of delay on survival in patients with breast cancer: A systematic review. Lancet 1999;353:1119–1126.
3. Jones BA, Patterson EA, Calvocoressi L. Mammography screening in African American women. Cancer 2003; 97(Suppl 1):258–272.
4. Kurtz ME, Given B, Given CW, Kurtz JC. Relationships of barriers and facilitators to breast self-examination, mammography, and clinical breast examination in a worksite population. Cancer Nurs 1993;16:251–259.
5. American College of Radiology. American College of Radiology (ACR) Breast Imaging Reporting and Data System Atlas (BI-RADS® Atlas). Reston, VA: ACR, 2003.
6. Battaglia TA, Roloff K, Posner MA, Freund KM. Improving follow-up to abnormal breast cancer screening in an urban population. A patient navigation intervention. Cancer 2007;109(Suppl 2):359–367.
7. Champion VL, Monahan PO, Springston JK, et al. Measuring mammography and breast cancer beliefs in African American women. J Health Psychol 2008;13:827–837.
8. Matthews CE, Shu XO, Jin F, et al. Lifetime physical activity and breast cancer risk in the Shanghai Breast Cancer Study. Br J Cancer 2001;84:994–1001.
9. Champion V, Skinner CS, Menon U. Development of a self-efficacy scale for mammography. Res Nurs Health 2005;28: 329–336.
10. Powe BD. Cancer fatalism among elderly Caucasians and African Americans. Oncol Nurs Forum 1995;22:1355–1359.
11. Powe BD. Perceptions of cancer fatalism among African Americans: The influence of education, income, and cancer knowledge. J Natl Black Nurses Assoc 1994;7:41–48.
12. Mayo RM, Ureda JR, Parker VG. Importance of fatalism in understanding mammography screening in rural elderly women. J Women Aging 2001;13:57–72.

13. Russell KM, Champion VL, Perkins SM. Development of cultural belief scales for mammography screening. Oncol Nurs Forum 2003;30:633–640.
14. Wallston BD, Wallston KA. Locus of control and health: A review of the literature. Health Educ Monogr 1978;6:107–117.
15. Holt CL, Lukwago SN, Kreuter MW. Spirituality, breast cancer beliefs and mammography utilization among urban African American women. J Health Psychol 2003;8:383–396.
16. Holt CL, Clark EM, Kreuter MW, Rubio DM. Spiritual health locus of control and breast cancer beliefs among urban African American women. Health Psychol 2003;22:294–299.
17. Fair AM, Wujcik D, Lin JM, Egan KM, Grau AM, Zheng W. Timing is everything: Methodologic issues locating and recruiting medically underserved women for abnormal mammography follow-up research. Contemp Clin Trials 2008;29:534–546.
18. Cohen SS, Signorello LB, Gammon MD, Blot WJ. Obesity and recent mammography use among black and white women in the Southern Community Cohort Study (United States). Cancer Causes Control 2007;18:765–773.
19. Fontaine KR, Cheskin LJ. Body weight and health care among women in the general population. Arch Fam Med 1998;7:381–384.
20. Ferrante JM, Chen PH, Jacobs A. Breast and cervical cancer screening in obese minority women. J Womens Health 2006;15:531–541.
21. Ferrante JM, Chen PH, Crabtree BF, Wartenberg D. Cancer screening in women: Body mass index and adherence to physician recommendations. Am J Prev Med 2007;32:525–531.
22. Wee CC, Phillips RS, McCarthy EP. BMI and cervical cancer screening among white, African-American, and Hispanic women in the United States. Obes Res 2005;13:1275–1280.
23. Wee CC, McCarthy EP, Davis RB, Phillips RS. Obesity and breast cancer screening. J Gen Intern Med 2004;19:324–331.
24. Coughlin SS, Uhler RJ, Hall HI, Briss PA. Nonadherence to breast and cervical cancers screening: What are the linkages to chronic disease risk? Prev Chronic Dis 2004;1:A04.
25. Wee CC, McCarthy EP, Davis RB, Phillips RS. Screening for cervical and breast cancer: Is obesity an unrecognized barrier to preventive care? Ann Intern Med 2000;132:697–704.
26. Zhu K, Wu H, Jatoi I, Potter J, Shriver C. Body mass index and use of mammography screening in the United States. Prev Med 2006;42:381–385.
27. Ostbye T, Taylor DH, Yancy WS, Krause KM. Associations between obesity and receipt of screening mammography, Papanicolaou tests, and influenza vaccination: Results from the Health and Retirement Study (HRS) and the Asset and Health Dynamics Among the Oldest Old (AHEAD) Study. Am J Public Health 2005;95:1623–1630.
28. Amy NK, Aalborg A, Lyons P, Keranen L. Barriers to routine gynecological cancer screening for white and African-American obese women. Int J Obes (Lond) 2006;30:147–155.
29. Fontaine KR, Heo M, Allison DB. Body weight and cancer screening among women. J Womens Health 2001;10:463–470.
30. Glasgow RE, Whitlock EP, Valanis BG, Vogt TM. Barriers to mammography and Pap smear screening among women who recently had neither, one or both types of screening. Ann Behav Med 2000;22:223–228.
31. Olson CL, Schumaker HD, Yawn BP. Overweight women delay medical care. Arch Fam Med 1994;3:888–892.
32. Wadden TA, Anderson DA, Foster GD, Bennett A, Steinberg C, Sarwer DB. Obese women's perceptions of their physicians' weight management attitudes and practices. Arch Fam Med 2000;9:854–860.
33. Stefanick ML, Anderson GL, Margolis KL, et al. Effects of conjugated equine estrogens on breast cancer and mammography screening in postmenopausal women with hysterectomy. JAMA 2006;295:1647–1657.
34. Chlebowski RT, Hendrix SL, Langer RD, et al. Influence of estrogen plus progestin on breast cancer and mammography in healthy postmenopausal women: The Women's Health Initiative randomized trial. JAMA 2003;289:3243–3253.
35. Banks E, Beral V, Cameron R, et al. Comparison of various characteristics of women who do and do not attend for breast cancer screening. Breast Cancer Res 2002;4:e-pub R1.
36. Lagerlund M, Maxwell AE, Bastani R, Thurfjell E, Ekbom A, Lambe M. Sociodemographic predictors of non-attendance at invitational mammography screening—A population-based register study (Sweden). Cancer Causes Control 2002;13:73–82.
37. Rosenberg L, Shapiro S, Kaufman DW, Slone D, Miettinen OS, Stolley PD. Patterns and determinants of conjugated estrogen use. Am J Epidemiol 1979;109:676–686.
38. Gomez SL, Tan S, Keegan TH, Clarke CA. Disparities in mammographic screening for Asian women in California: A cross-sectional analysis to identify meaningful groups for targeted intervention. BMC Cancer 2007;7:e-pub 201.
39. Margolis KL, Lurie N, McGovern PG, Tyrrell M, Slater JS. Increasing breast and cervical cancer screening in low-income women. J Gen Intern Med 1998;13:515–521.
40. Grimes DA, Schulz KF. Bias and causal associations in observational research. Lancet 2002 Jan;19;359(9302):248–252.
41. Friis R, Sellers T. Data interpretation issues. In: Friis R, Sellers T, eds. Epidemiology for public health practice. Sudbury:MA Jones and Bartlett Publishers 2008:385–404.
42. Champion VL, Menon U, McQuillen DH, Scott C. Validity of self-reported mammography in low-income African-American women. Am J Prev Med 1998;14:111–117.
43. Schlesselman JJ, Stolley PD. Sources of bias. In: Schlesselman JJ, Stolley PD, eds. Case-control studies: Design, conduct, analysis. New York: Oxford University Press, 1982:124–143.
44. Russell KM, Maraj MS, Wilson LR, Shedd-Steele R, Champion VL. Barriers to recruiting urban African American women into research studies in community settings. Appl Nurs Res 2008;21:90–97.
45. Corbie-Smith G, Frank E, Nickens HW, Elon L. Prevalences and correlates of ethnic harassment in the U.S. Women Physicians' Health Study. Acad Med 1999;74:695–701.
46. Rothman KJ, Greenland S. Accuracy considerations in study design. In: Rothman KJ, Greenland S, eds. Modern epidemiology. Philadelphia: Lippincott-Raven Publishers, 1998:135–145.
47. Moorman PG, Newman B, Millikan RC, Tse CK, Sandler DP. Participation rates in a case-control study: The impact of age, race, and race of interviewer. Ann Epidemiol 1999;9:188–195.
48. Fredman L, Sexton M, Cui Y, et al. cigarette smoking, alcohol consumption, and screening mammography among women ages 50 and older. Prev Med 1999;28:407–417.
49. Gooden KM, Carter-Edwards L, Hoyo C, et al. Perceptions of participation in an observational epidemiologic study of cancer among African Americans. Ethnic Dis 2005;15:68–75.

Address correspondence to:
Alecia Malin Fair, Dr.P.H.
Department of Surgery
Meharry Medical College
1005 Dr. D. B. Todd Boulevard
Nashville, TN 37208

E-mail: afair@mmc.edu